CLASS NOTES

This is a laboratory course designed to develop your skills in dealing with experimental problems. A good experimentalist must have several important qualifications. He must have, or develop, the ability to pay strict attention to detail, to reason scientifically, and to master new techniques and manipulate equipment.

Laboratory work is not a jumble of unrelated operations; there must be a good reason for everything that you do. If you DO NOT KNOW WHAT YOU ARE DOING AND WHY YOU ARE DOING IT, YOU DO NOT BELONG IN A LABORATORY.

GRADING

Each experiment will be worth 60 points (with exceptions), with the following breakdown:

- PRELAB and PRELIMINARY NOTEBOOK ENTRIES, including SAFETY EVALUATION 15 points
- PROCEDURE, DATA, and OBSERVATIONS 25 points
- SUMMARY SHEET & PRODUCT EVALUATION 20 points
- TOTAL 60 points

Safety evaluation

Your safety evaluation will be based on at least some of the following items:

1. Following the "Safety in the Laboratory" rules.
2. Ability of you and your partners to work together on an experiment and budget your time.
3. Whether or not you are careless with equipment, reagents, and solvents.
4. Cleaning up work bench and hood; putting equipment back where it belongs - clean!
5. PROPER DISPOSAL OF WASTES

Prelab and Notebook

Some preparation is required before coming into the laboratory. This will include reading the experiment and operations involved, and making some preliminary entries in your notebook. A notice explaining the grading of late assignments is posted in the lab.

NOTE: You will not be allowed to have your lab manual with you during the laboratory. You may have the experimental procedure and details with you as hand-written notes (not in your notebook, however) but not as a photocopy. You will find the laboratory experiments much faster and easier if you are thoroughly acquainted with the experiment beforehand.

An accurate record of your experimental procedure, results, observations, and conclusions is an indispensable part of scientific work. Human memory is faulty and unreliable enough that a written record of results is necessary for future reference. Your notebook should be written so that it is intelligible to anyone conversant with the subject. I call your attention to the excerpt from the Journal of Chemical Education concerning Victor Grignard's notebook. You are to follow the guidelines given there as well as the ones given below.
Additional rules for notebooks:

1. It must be hardbound, and written in ink. We prefer a bound notebook with duplicate pages (carbon copies, MTU Bookstore #09-9088).
2. The cover should have:
   a. your name
   b. course, section, term
   c. locker number and telephone number
3. Include a table of contents with experiment titles, page numbers, and dates.
4. Each page should be numbered and dated as you use it.
5. Entries should be legible and well spaced from one another. Do not crowd data together as there is ample room in the notebook. Leave room for instructors to write grades and comments. Use a margin on left and right sides.
6. Write data into the notebook IMMEDIATELY AND DIRECTLY. Do not use a separate sheet of paper, or pencil.
7. Identify entries with labels like "weight of weighing bottle". The significance of an entry may become useless with the passage of time.
8. All entries are to be made in ink. If an error is made, simply draw a single line through the material to be deleted and continue with your entry.
9. Pages are not to be torn out of the lab notebook.
10. You are to refer to and use your notebook throughout the experiment. Some care in taking notes is important (written entries should be intelligible), but an immediate record of the experiment - even with spills and blots - is of prime importance.

Suggested Notebook Format

Again, prior to the lab meeting you will carefully read over the experiment to be performed, and also read all operations used in the experiment. In your notebook, you will (1) title the experiment; (2) prepare a table of physical data of the organic reagents and products for the experiment. Inorganic reagents should also be included in the table, if pertinent. This will include name, structural formula, molecular weight, boiling point/melting point, density, solubility, color, grams (milliliters) used and moles; (3) prepare a hazard table containing data on all organic and hazardous inorganic reagents used. List the hazards in words. Do not use the hazard sign given in the textbook. (4) write balanced reactions for the experiment and define the limiting reagent; (5) give the simple theory and purpose of the experiment. During the course of the experiment you will record your procedure, all of your data, observations, (and possible interpretations if necessary), problems encountered and how you solved them; also include any graphs, spectra, chromatograms, etc.

Do not copy procedures or results from the lab manual into your notebook.

Summary Sheet

Upon completion of the experiment, you will prepare a summary sheet to turn in. It will be due one week after the scheduled completion of the experiment. The format may vary somewhat depending on the experiments. Specific requirements will be given by the instructor, but it will include mainly your results, and your analysis of those results. Your product from each experiment will also be turned in.
Some points to be considered in the overall content of the summary report are:

1. Conciseness: Wordy, flowery explanations that don't say much are to be avoided.
2. Completeness: Were all the important ideas covered?
3. Error Analysis:
   - Discussion of low yield, mp and bp; this explanation should be justifiable from the data; comparison to expected results (literature values) and reasoning behind this comparison (is it sound?). This discussion should not be a blind shot in the dark but based on sound scientific reasoning. Areas in the procedure that could have affected the experimental results (how and why).
4. Problems that arose during the experiment and what the solution was and why. Also pertinent observations and their interpretation.

WASTE DISPOSAL

Liquid wastes are divided into two basic categories: those that can be poured down the sink and those which must be collected and shipped to a disposal site. Wastes that can be poured down the sink include: aqueous solutions, methanol, ethanol, other water miscible alcohols, and acetone. Make sure the water is running while these liquids are being poured into the sink; continue the running water for a few minutes to reduce the possibility of a hazardous vapor mixture forming.

All other liquid wastes will be deposited in the special containers provided. Anyone putting waste in the container must record the name(s) of the compound(s) and the amount(s) deposited.

NOTE: Acetone or methanol used to rinse or clean glassware is to be saved and reused. Students are provided with wash bottles for this purpose. This will help cut down on the amount of acetone we use and the amount requiring disposal.